

# ***WATER QUALITY***

## **BENEFICIAL USE ATTAINMENT**

The Nodaway River system is designated as suitable for aquatic life, fishing, wildlife and livestock watering (MDNR 1986a, MDNR 1995, IAC 1995). A 12 mile section of the river upstream of Clarinda, Iowa is designated as a raw water source for potable water supply (IADNR 1997a). Several small lakes in the Iowa section of the basin are designated for water supply and/or whole body contact (IADNR 1997a). The Nodaway River basin in Iowa was assessed as partially supporting its designated uses (IADNR 1997b). Small isolated reaches of quality habitat and diverse aquatic communities were found but these were considered atypical of the basin in general (IADNR 1997b). The designation of partially supporting means that a healthy community of regionally distributed aquatic species, expected to be encountered in sampling, are limited in the system (IADNR 1997a). Numbers and diversity of aquatic organisms are expected to remain low because of channelization, sedimentation, and periodic low dissolved oxygen concentrations (MDNR 1995). Soil erosion, sediment deposition, and turbidity all contribute to aquatic habitat degradation (MDNR 1986a). The main water problem in the Nodaway basin in Iowa is agricultural non-point source pollution in the form of sediment (IADNR 1997b). If erosion, stream channel modification, and increased nutrient inputs, and their related water quality problems continue, beneficial uses will not be attained in the future.

## **CHEMICAL QUALITY OF STREAM FLOW**

It is probable that the streams in northwest Missouri were historically turbid during and after periods of high discharge due to the nature of the soils in the area. The activities of man, chiefly channelization and poor agricultural practices, have magnified sediment delivery, turbidity, and their associated problems in the waters of northwest Missouri (MDNR 1986a).

The trend in the Nodaway River from 1968 to 1984 was increasing nitrate concentrations due to agriculture (fertilizer runoff and animal wastes; MDNR 1986a). Water quality at low flows deteriorates due to lack of water volume to dilute point and non-point source pollution (MDNR 1986a). Soil erosion, sediment deposition, and turbidity all contribute to water quality degradation (MDNR 1986a). Temperatures in excess of 27° C are detrimental to spawning and egg development of many fish. Because of shallow water and low flows, this temperature is probably exceeded regularly in the Nodaway River and its tributaries (USDA-SCS 1982). Minimal effects are seen from sewage treatment plants (MDNR 1995). In general water quality in the Nodaway basin in Iowa is good, but low flows and excessive sediment cause problems and threaten to further degrade water quality if current agricultural practices continue (IADNR 1997b). Table 9 presents data for water quality in the Nodaway River in Missouri for two years and how they compare to state established water quality standards.

## **CONTAMINANTS, FISH KILLS, AND HEALTH ADVISORIES**

Fish consumption advisories have been issued for all waters of Missouri, excluding the Ozarks, by the Missouri Department of Health (MDOH) since 1985 (MDOH 1996). The MDOH recommends eating no more than one pound per week of bottom feeding fish such as catfish,

buffalo, drum, common carp, suckers, and paddlefish, from the Nodaway River and its tributaries

(MDC 1997). No consumption advisories apply to bass, sunfish, crappie, or walleye (MDOH 1996).

In 1971, Reliable Rendering Company of Quitman, Missouri was reportedly discharging untreated waste into the Nodaway River, which posed a health and odor problem, but was small enough in quantity that it probably created no measurable effect on water quality (Ryck MDC, internal memo May 20, 1971). In 1984 a fish kill on the East Nodaway River in Iowa was caused by a pesticide spill, but the magnitude and number of fish killed were not known (John Olson IADNR, personal communication).

With the erosive nature of area soils and the increased water velocities due to channelization, several emergency channel stabilization efforts have been undertaken to prevent undermining of bridges, roads, and pipelines. If the river were to erode around a buried pipeline, a significant spill could occur with detrimental effects on downstream habitat and wildlife (MDC files).

A possible threat to the basin is the increasing number of concentrated animal feeding operations. Manure spills and improper land application of waste residues from these facilities have caused serious water quality problems and fish kills in other river basins in Missouri (MDNR 1996a). Low base flows and the reduced volume of water associated with them could create serious problems for aquatic communities in the Nodaway River basin if improper disposal practices at one of these facilities were to occur.

## **WATER USE**

### **Municipal**

Several communities including Maitland, Clearmont, Graham, Skidmore, Fillmore, and Burlington Junction in Missouri, and Greenfield, Fontanelle, Nodaway, Prescott, Cumberland, Villisca, College Springs, Braddyville, and Shambaugh in Iowa withdraw water from the unconsolidated aquifer near the Nodaway River. Both Clearmont and Maitland, Missouri have a chronic problem of drinking water exceeding the standard for nitrate contamination (MDNR 1995). The primary source suspected of creating the problem is local agricultural activities (MDNR 1995). Groundwater in the Nodaway basin in Iowa generally does not meet Iowa Department of Environmental Quality (IDEQ) standards for drinking water due to excessive total dissolved solids, nitrates, iron, manganese, chloride, and/or sodium (USDA 1981).

Surface water is usually high in iron or manganese but is economically treatable and total dissolved solids and nitrates normally meet the standards set by the IDEQ (USDA 1981). The only surface water intake on the Nodaway River for municipal drinking water use is at Clarinda, Iowa. Several small lakes in the Nodaway watershed, in Iowa, are surface water sources for municipal water supply (IADNR 1997a).

### **Agricultural**

Livestock watering is the largest water use in the Nodaway River basin (MDNR 1986a). Small areas have been irrigated but highly mineralized and unreliable water sources have limited this practice (USCOE 1973). In 1977, about 21,000 acres were irrigated in northwest Missouri. This was projected to increase to 100,000 acres by the year 2000 with the Nodaway River basin

included in the area where the greatest increase would occur (Skelton, et al. 1982). Irrigation in Andrew, Holt, and Nodaway counties totaled 42.8 million gallons in 1996 (MDNR 1996a).

### **POINT SOURCE POLLUTION**

Only 0.7 miles of the Nodaway River system in Missouri was estimated to be impacted by point source pollution from sewage treatment plants (MDNR 1995). These areas were small reaches below the Burlington Junction and Skidmore, Missouri sewage treatment plant discharges (MDNR 1995). There are no permitted discharges of metals or toxic organic materials in the Missouri section of the Nodaway basin (MDNR 1995). Table 10 lists all permitted wastewater discharges (Figure wt) in the Nodaway River basin. Table 11 lists all other point source discharges in the Nodaway River Basin.

Concentrated animal feeding operations (CAFOs) are a growing presence in the basin (38,536 Population Equivalency units (PE) in MO, and 63,300 PE in IA). A listing of all permitted CAFOs (Figure wt) in the basin are found in Table 12. History indicates that problems with discharges from these operations sometimes occurs. This could seriously impact the water quality and aquatic organisms in the Nodaway River basin should an accidental discharge occur.

The number of hogs and cattle in the basin are considered to be equivalent to a human population of 1.03 million (MDNR 1995). This is roughly 30 times larger than the human population in the basin. Concentrated animal feeding operations are classified as point source discharges and make up 101,836 PE in the basin. The remainder are from ranging livestock.

### **NON-POINT SOURCE POLLUTION**

Non-point source pollution causes most water quality problems in the Nodaway River basin (MDNR 1995). Soil erosion, sediment deposition, and turbidity all contribute to water quality degradation (MDNR 1986a). Soil erosion, channelization, and livestock waste are the three main sources of non-point source pollution (MDNR 1995).

In 1980, soil erosion was estimated to be 17.1 tons/acre/year due to sheet erosion, 4.8 tons/acre/year due to gully erosion, and the sediment yield by streams was 6.1 tons/acre/year (Anderson 1980). On some cropland not protected by conservation practices, the soil loss rate was found to be as high as 30 tons/acre/year (USDA-SCS 1983). In 1995 the estimates were 13-18 tons/acre/year due to sheet erosion, 0.8 - 1.1 tons/acre/year due to gully erosion, and suspended sediment delivery by streams was 3.5 tons/acre/year (MDNR 1995). This indicates progress is being made but probably not enough to help the stream resources impacted by sediments.

Table 9. Selected water-quality data for the Nodaway River near Graham, MO at gauge station 06817700, water years 1993 and 1996 (USGS 1994, USGS 1997, Missouri Code of State Regulations 10 CSR 20.7).

Parameter	State Standard				Water Year	Water Year
	I	III	VI	VII	1993	1996
Temperature (Deg. C)	32 deg max				0.0-27.0	0.5-27.0
Specific Conductance (us/cm)					154-435	216-580
Oxygen, dissolved (mg/l)	5				6.0-14.3	6.7-18.6
Coliform, fecal (Cols./100 ml)				200-storm runoff	<sup>K</sup> 150- <sup>K</sup> 56,000	<sup>K</sup> 24- <sup>K</sup> 26,000
Streptococci, fecal (Cols./100 ml)					<sup>K</sup> 110- <sup>K</sup> 49,000	27-46,000
Total hardness (mg/l) CaCO <sub>3</sub>					61-180	130-190
Nitrogen, total ammonia + organic (mg/l as N)	dependent on pH and temp.				0.34-11.0	0.45-5.0
Phosphorus, total (mg/l as P)					0.14-1.2	<0.02-1.50
Manganese, dissolved (ug/l as Mn)		50		50	9-22	0.60-220
Iron, dissolved (mg/l as Fe)	1,000	300		300	12-400	5-24
<sup>K</sup> : Non-ideal count of colonies (e.g., sample was not diluted enough, colonies merged)						
I: Protection of aquatic life						
III: Drinking water supply						
VI: Whole body-contact recreation						
VII: Groundwater						

Table 10. Permitted wastewater treatment facilities (WWTF) in the Nodaway River basin.

Facility	Receiving Stream	Location (T-R-S)	State	County
Fontanelle WWTF	Middle Nodaway River	75N-32W-19	IA	Adair
Bridgewater WWTF	West Fork	75N-33W-33	IA	Adair
Adams Co. Care Facility WWTF	East Nodaway River	71N-34W-01	IA	Adams
Corning WWTF	East Nodaway River	71N-34W-03	IA	Adams
Corning Quarry	East Nodaway River	71N-34W-10	IA	Adams
Nodaway WWTF	East Nodaway River	71N-35W-19	IA	Adams
Prescott WWTF	East Nodaway River	72N-33W-23	IA	Adams
Mt. Etna Quarry	Middle Nodaway River	73N-34W-14	IA	Adams
Fillmore WWTF	Trib to Lincoln Creek	60N-36W-07	MO	Andrew
Massena WWTF	West Nodaway River	75N-32W-19	IA	Cass
Cumberland WWTF	Houts Branch	75N-35W-28	IA	Cass
New Point Quarry	Trib to Nodaway River	61N-37W-27	MO	Holt
Maitland WWTF	Trib to Nodaway River	62N-37W-04	MO	Holt
MMA Maitland Quarry	Trib to Nodaway River	62N-37W-34	MO	Holt
DNR Viking Lake State Park	Dunns Creek	71N-36W-07	IA	Montgomery
Villisca WWTF	Middle Nodaway River	71N-36W-27	IA	Montgomery
Graham WWTF	Elkhorn Creek	62N-37W-11	MO	Nodaway
ANR Maitland Station	Elkhorn Creek	63N-36W-29	MO	Nodaway
Forcade Quarry	Elkhorn Creek	63N-37W-36	MO	Nodaway
Burlington WWTF	Nodaway River	65N-37W-08	MO	Nodaway
Elmo WWTF	Mill Creek	66N-37W-17	MO	Nodaway
Clearmont WWTF	Clear Creek	66N-37W-25	MO	Nodaway
Shambaugh Quarry	Nodaway River	67N-36W-19	IA	Page
Braddyville WWTF	Nodaway River	67N-36W-30	IA	Page
Shambaugh WWTF	West Nodaway River	67N-37W-01	IA	Page
College Springs WWTF	Mill Creek	67N-37W-18	IA	Page
Clarinda WWTF	West Nodaway River	69N-36W-29	IA	Page

Table 11. Permitted point source discharges in the Nodaway River basin.

Facility	Receiving Stream	Location (T-R-S)	State	County
Adair County Maintenance Yard	Tributary of Middle Nodaway River	75N-31W-7	IA	Adair
Bloom Auto Repair	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Cardinal Insulated Glass Co.	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Feeders Service Inc.	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Greenfield Lawn & Leisure	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Greenfield Manor Inc.	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Iowa Dept. of Transportation	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Mac's Electric & Hardware	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Schildberg Cons.-Truck Shop	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Siegwerk Inc.	Tributary of Middle Nodaway River	75N-34W-7	IA	Adair
Adams & Taylor Co. Regional	East Nodaway River	72N-34W-34	IA	Adams
AT&T Long Lines	East Nodaway River	72N-34W-35	IA	Adams
Brown Bear Corp.	East Nodaway River	72N-34W-27	IA	Adams
Burcliff Industries Inc.	East Nodaway River	72N-34W-27	IA	Adams
Curtis Animal Health Products	East Nodaway River	72N-34W-35	IA	Adams
Defender Company	East Nodaway River	72N-34W-34	IA	Adams
Iowa Dept. Of Transportation	Tributary of Kent Creek	72N-34W-22	IA	Adams
Precision Pulley Inc.	East Nodaway River	72N-34W-27	IA	Adams
Precision Inc. Corning # 2	East Nodaway River	72N-34W-27	IA	Adams
UARCO Inc.	East Nodaway River	72N-34W-35	IA	Adams
Wirecraft Iowa	East Nodaway River	72N-34W-35	IA	Adams
Bower Welding & Fabrication	Tributary of West Nodaway River	72N-34W-33	IA	Cass
IES Utilities Inc.	Houts Branch	75N-35W-22	IA	Cass
Lawrence Eilts	Sevenmile Creek	75N-35W-10	IA	Cass
Massena Ag Center	West Nodaway River	75N-34W-28	IA	Cass
Terra Western Corp.	Middle Nodaway River	71N-36W-27	IA	Montgomery
Villisca Lockers	Middle Nodaway River	71N-36W-27	IA	Montgomery
Southwestern Bell Tele. Co.	Nodaway River	65N-37W-16	MO	Nodaway
Southwestern Bell Tele. Co.	Nodaway River	65N-37W-16	MO	Nodaway
AT&T Long Lines	Tributary of Nodaway River	67N-37W-14	IA	Page

Facility	Receiving Stream	Location (T-R-S)	State	County
Cardinal Body Shop	Nodaway River	69N-36W-31	IA	Page
Carpenters Body Shop	Nodaway River	69N-36W-31	IA	Page
Deans Dry Dock	Nodaway River	69N-36W-31	IA	Page
H&H Trailer Company	Nodaway River	67N-37W-36	IA	Page
Iowa Dept. of Transportation	Nodaway River	69N-36W-31	IA	Page
Lisle Corp.	Nodaway River	69N-36W-31	IA	Page
NSK Corporation	Nodaway River	69N-36W-31	IA	Page
Sherwin-Williams	Nodaway River	69N-36W-31	IA	Page
Snyders Auto Body & Paint	Nodaway River	69N-36W-31	IA	Page
Wynn's Ag Center Inc.	Nodaway River	69N-36W-31	IA	Page

Table 12. Permitted Concentrated Animal Feeding Operations (CAFOs) in the Nodaway River basin.

Facility Name	Facility ID	County/State	Design Pop. Equivalent	Animal Units <sup>1</sup>	Animal Type <sup>2</sup>	Facility Type <sup>3</sup>	Location
Ambrose, Robert	LA7000206	Nodaway MO	1,100	500	SF		63N-38W-12
Archibald, Charles	LA7000239	Andrew MO	315	70	SS		59N-36W-19
Barr, William B.	LA7101321	Andrew MO	792	360	SF		61N-37W-12
Blackford, Ercille	LA7000205	Nodaway MO	660	300	SF		66N-37W-11
Burnett, Jerry	LA7103822	Holt MO	1,950	Unknown	SN	AE LA	59N-37W-03
Coston, W.F.	LA7100048	Nodaway MO	880	400	SF		64N-37W-35
Custer, B.	LA7000204	Holt MO	2,613	310	SS		62N-37W-06
Fink and Kurtz Farm	LA7000027	Holt MO	440	200	SF	AN LA	60N-37W-34
Flangan, Randy	LA7000212	Nodaway MO	1,164	152	SS		67N-36W-34
Gresky, Robert	LA7000510	Nodaway MO	792	360	SF		65N-37W-26
H.R.S. Farms	LA7102907	Holt MO	13,538	967	BF	AN LA (2)	63N-37W-20
Hansen, Paul A. Jr.	LA7000077	Nodaway MO	550	250	SF		64N-36W-33
Jennings, Donald	LA7101720	Andrew MO	376	24	SS	AN LA	59N-36W-06
Logsdon, Clifton	LA7000192	Nodaway MO	3,075	450	SS		65N-36W-23
Luce, Jim	LA7000276	Holt MO	180	40	SS		61N-37W-29
MFA Livestock Assoc.	LA7000251	Nodaway MO	506	230	SF	AN LA	65N-37W-11
Nelson, Herschel	LA7000124	Nodaway MO	830	800	SN		62N-37W-11
Noellsch Stock & Grain	LA7000181	Holt MO	1,188	540	SF		60N-38W-13

Facility Name	Facility ID	County/State	Design Pop. Equivalent	Animal Units <sup>1</sup>	Animal Type <sup>2</sup>	Facility Type <sup>3</sup>	Location
NWMS Test Station	LA7000505	Nodaway MO	528	240	SF		64N-38W-13
Schafer, John	LA7000407	Nodaway MO	1,286	212	SS		62N-36W-10
Schafer, Martin	LA7000423	Nodaway MO	660	300	SF		63N-36W-35
Tally, Melvin	LA7000028	Nodaway MO	440	200	SF		63N-37W-01
Townsend, Dick	LA7100735	Andrew MO	924	420	SF		61N-36W-23
Vest, Roger	LA7103790	Nodaway MO	2,070	90	SS	AN LA CPIT	64N-36W-21
Walker, Mike	LA7102687	Andrew MO	175	250	SN		61N-36W-11
Sindt, Kevin		Cass IA	3,360*	224,000	swine		74N-36W-10
Cooper, Blake		Adams IA	8,100*	540,000	swine		72N-33W-01
Steele, Doug		Adair IA	7,560*	504,000	swine		76N-33W-18
Wheeler, Dale		Adams IA	28,350*	1,890,000	swine		72N-35W-19
McCarty, Karl		Adams IA	4,050*	270,000	swine		72N-33W-13
Rice, Gregory		Adams IA	4,050*	270,000	swine		73N-32W-16
West, Gary		Adams IA	4,050*	270,000	swine		72N-32W-20

<sup>1</sup> - Iowa animal units are reported in pounds of livestock

<sup>2</sup> - Swine finishing (SF), Swine nursery (SN), Sows, boars, farrowing (SS) unknown operation type listed by animal.

<sup>3</sup> - AE LA - aerobic lagoon, AN LA- anaerobic lagoon, CPIT - concrete pit

\* - Based on MDNR conversion methodology where 1000 pounds equals 15 population equivalent units for swine